10. *New Colobognatha from South Africa.*
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(With Plate XII.)

Introductory Remarks.

Until a few years ago not a single member of the Colobognatha was known from South Africa, and Attems in his Myriopoda of South Africa was the first to record a representative of this order, with its peculiarly modified mouthparts, in *Burenia nasuta* Att. I had therefore great pleasure in receiving from Dr. R. F. Lawrence, formerly of the South African Museum, Cape Town, an interesting series of South African Myriopods, among which I found three new species of Colobognatha, belonging to the genera *Burenia, Rhynchomecogaster* n. gen., and to the genus *Cylichnogaster* which has been described in a previous paper. Four species of Colobognatha belonging to three genera are thus now known from South Africa, and it can be safely predicted that many more new forms of this order await discovery, especially from the mountainous regions of South Africa. A study of the South African Colobognatha led me to question whether the definition of the Hirudisominae, as given by Attems in the work cited above and in Kükenthal's Handbuch der Zoologie, Bd. 4, 1926, p. 213, is a correct one?

His key to the genera of the Hirudisominae is as follows:—

1*a*. Two or three ocelli on each side. Anal segment completely concealed by the preanal segment and not visible from above . *Hirudisoma* Cav.
1*b*. One ocellus on each side. Anal segment partly visible from above. . 2.
2*a*. Pleurites connected with the tergites by membranes. Anterior gonopod 4-jointed, posterior gonopod 3–5 jointed . . *Rhinotus* Cook.
2*b*. Pleurites nearly coalescent with the tergites . . . . . 3.
3*a*. Anterior gonopod 6-jointed, posterior gonopod 7-jointed, the latter with a bristle only on the third joint . . . . *Burenia* Attems.
3*b*. Anterior gonopod 3-jointed, posterior gonopod 5-jointed, both pairs with groups of bristles bearing accessory spicules . . *Siphonotus* Bröl.

The Telson of the Colobognatha.

A complete reinvestigation of the telson of *Hirudisoma* as compared with those of other genera is very necessary, seeing that, on the one

hand, this structure has not been clearly enough defined; on the other, the distinctions expressed in Attems' key under 1*a* and 1*b* give rise to serious doubts. Furthermore, the difference in the number of ocelli is an untenable character and should certainly not be used in generic distinctions.

In the telson of the Diplopods we have to distinguish between an anal and a preanal segment (figs. 1 and 2). As Attems speaks only of an anal segment it is doubtful if he means thereby the true anal segment or the whole telson. The distinctions in the anal segment expressed by Attems under 1*a* and 1*b* are made clear in fig. 1 for *Hirudisoma*, and fig. 2 for the other genera. In fig. 1 the anal segment is thus seen to be shifted far forward, while in fig. 2 it projects somewhat with its posterior extremity.

Even so the distinctions between *Hirudisoma* and the other genera have not been sufficiently defined. If we consider the Diplopoda in general, there is no doubt that a telson clearly visible from above represents a primitive condition as contrasted with one which has been shifted forwards, because the simple position of the somites, one behind the other, constitutes the most primitive condition that we can conceive. Thus fig. 2 shows the primitive structure of the telson in *Rhynchomegaster* (and *Burenia*), while in *Hirudisoma* it is indubitably of a secondary nature.

We have thus in figs. 1 and 2 three segments posterior to the last leg-bearing somite, viz. a posterior legless segment (ul), a preanal segment (pr), and an anal segment consisting of two lateral anal valves (an).

In *Burenia* and its allies (fig. 2) only the ventral part of the legless segment is visible from below, but in *Hirudisoma* (fig. 1) the telson (pr + an) has moved so far forward that a section of the dorsal part of the legless segment is visible behind it. The extreme hind margin of the body is thus part of the last segment in *Hirudisoma*, while in the genera represented by fig. 2 it is formed by the telson. In the latter the anal valves are placed so far back that they are situated entirely behind the legless segment, being at the same time only partly enclosed by the preanal segment, while they are also much shorter than the section of the preanal segment anterior to them. The anal valves of *Hirudisoma*, on the other hand, have not only drawn nearer the legless segment (fig. 1), but they are so largely enclosed by the preanal segment that they are longer than the section of the preanal segment in front of them, in which the ventral displacement in an anterior direction is especially marked.

From these conditions it appears that the distinctions between *Hirudisoma* and the other genera are more far-reaching and complicated than those used in the above-mentioned key of Attems.

This difference in the structure of the telson runs parallel with another in respect of the mouthparts, up to now unknown. *Hirudisoma*, on account of its mouthparts and especially the fairly well-developed wedge-shaped mandibles, is allied to *Polyzonium*. In *Burenia* and its allies, on the other hand, there are no such wedge-shaped mandibles, showing that degeneration has already gone a long way.

Similarly, the prolongation of the anterior part of the head in *Burenia* and its allies is far more marked than in *Hirudisoma*, indicative of an approach to the *Siphonophoridae*. The conclusion I am forced to draw from all these differences is that *Burenia* and its allies form a distinct family standing midway between *Hirudisoma* and the *Siphonophoridae*. *Hirudisoma* is, however, so widely different from the *Polyzoniidae* that it represents a separate family between the *Polyzoniidae* and the *Bureniidae*. The following are the points of difference between the two families:—

A. The telson is so completely sunk in the preceding segment that it is not visible from above (fig. 1). The anal valves are so sunk in the preanal segment that they are almost encircled by it. The dorsal posterior margin of the preanal segment lies far in front of that of the preceding segment, the telson being less than half as wide as the latter. Head but little projecting so that anteriorly it forms a right angle or almost a right angle. The mandibles are developed as biting organs in the form of little wedges like those of *Polyzonium*.

> Family *Hirudosomidae* n. fam. (for *Hirudosoma*).

B. The telson is not completely sunk in the preceding segment (fig. 2), the hinder end being thus to a large extent visible from above. The anal valves are only slightly sunk in the preanal segment and are situated so far back that they are much shorter than the ventro-preanal portion in front of them. The dorsal hinder margin of the preanal segment lies behind that of the preceding segment. The telson is much more than half as wide as the latter. Head strongly projecting anteriorly so that its apex forms less than half a right angle, thus appearing beak-like. The mandibles are not modified to form wedge-shaped biting organs.

> Family *Bureniidae* n. fam. (containing the genera *Burenia*, *Rhynchomecogaster* n. gen., *Cylichnogaster*, *Rhinotus*, and *Siphonotus*).

The family *Bureniidae* can be divided into the following subfamilies:—

a. Body short and broad, able to enroll. Trunk with 20–26 segments. Pleurites transversely rectangular

> 1. Subfamily *Cylichnogastrinae* (for *Cylichnogaster* mihi).

b. Body longer and more slender, with 35–90 segments, never able to enroll. Pleurites of more or less quadrate form (figs. 3 and 4)
>> 2. Subfamily *Bureniinae* (containing the remaining genera).

The two genera *Rhinotus* (from Sierra Leone, Madagascar, Seychelles, and the Malayan-Australian region) and *Siphonotus* (from South America and the Malayan-Australian region) have 3–4 jointed anterior gonopods and 3–5 jointed posterior gonopods in common as distinguished from the South African genera *Burenia* and *Rhynchomecogaster*; they require, however, further investigation with regard to other characters.

Rhynchomecogaster n. gen.

The genus is most closely allied to *Burenia*, from which, however, it can be distinguished as follows:—

Rhynchomecogaster mihi.

Metatergites clothed with such numerous and long hairs that they have a silky sheen. Collum provided with such numerous and long hairs (fig. 5) that 7–8 rows can be distinguished, which are, however, not all regular. Pleurites (fig. 3) with hairs on their outer posterior sides and also partly on the inner ones. Head acuminate anteriorly and without sensitive rods at its apex. One simple bristle near the claw of the anterior pair of legs in the ♂. Terminal segment of the anterior gonopods (fig. 6) drawn out into a recurved hook which reaches to beyond the femur. Terminal segment on the outer side without a lobe. Prefemur of the anterior gonopod plate-like, well defined on the inner and outer sides (fig. 6).

Burenia Attems.

Metatergites sparsely clothed at the sides with short hairs so that the back appears smooth and shiny. Collum also with hairs mainly at the sides, but these so few and small that it appears hairless. Pleurites with only a few weak hairs at the sides on the outer and posterior portions (fig. 4). Head truncate anteriorly, usually with 2 + 2 very small sensory rods.* A small thickened tongue-like bristle near the claw of the anterior pair of legs in the ♂ (cp. Attems' figs. 416, 419, and 420). Terminal segments of the anterior gonopod produced into a process which at most only reaches to the femur. On the outer side of the terminal segment a marginal lobe (cp. fig. 9).† Prefemur of the anterior gonopod cuneiform, its inner surface so much contracted as to be indistinct (prf., fig. 8).

COMPARATIVE ANATOMY OF THE ANTERIOR AND POSTERIOR GONOPODS.

It is easy for errors to arise respecting the segmentation of the anterior and posterior gonopods of the Colobognatha, as the bound-

* Attems made these much too large in his fig. 412.
† Attems denoted the marginal lobe with "lo" in his fig. 414.

aries of the segments are often difficult to make out, while sometimes they actually have partly disappeared (fig. 9). This being so, it is important to study the relations of the muscles, because a correct idea of the segmentation can be gained from the well-defined points of insertion of these muscles. Regarding their segmentation, the anterior and posterior gonopods are homodynamous throughout— that is, of equal value—apart from the differences of the segments. Both pairs of appendages are 6-jointed in the South African *Bureniidae*. The muscles of the gonopods constitute two segments, one behind the other, which do not overlap each other, *i.e.* a basal and an apical. The apical muscles always end basally on the inner side of a terminal joint which is drawn out distally into a process. Whether this process constitutes merely a claw or a tarsungulum is a point which cannot be decided with certainty. On account of the small change which had taken place in the anterior gonopods of the Colobognatha in contrast to the walking legs (in comparison with other Proterandria), it is probable that they have retained their original postfemur. Then the segments marked (*a*) in figs. 6 and 9 would have to be regarded as the postfemur, (*b*) as the tibia, and (*c*) as the tarsungulum, and the same with the posterior gonopods (fig. 10). It is noteworthy that the muscle segments of the anterior gonopods have apparently different relations in *Burenia* and *Rhynchomecogaster*, for although 5 segments follow after the coxa (co) in both genera, the basal muscle segment in *Rhynchomecogaster* traverses two joints, the terminal muscle segment three joints; in *Burenia* the basal muscle segment traverses only one, the terminal four, joints. As the gonopod segmentation in *Rhynchomecogaster* is much more clearly defined than in *Burenia*, the former genus must be regarded as deciding the issue. There are also in these gonopods four distinct telopodite segments between coxa and terminal joint, as in the walking legs. In *Burenia*, on the other hand, I observed only one well-defined segmental boundary, the others being more or less indistinct and imperfect. This applies to the species before me, *B. attemsii* n. sp., while Attems, in his fig. 423 of *B. nasuta*, gives six distinctly separate segments, of which the second, the prefemur, appears as a wedge-shaped segment developed only on the outer side.

The muscles of *Burenia* and *Rhynchomecogaster gracile* (fig. 6) according to their positions thus show a difference of one segment as has been figured for *Burenia attemsii* in fig. 9. There is in *Burenia attemsii*, however, a fine striated band behind the coxa, marked (x) in fig. 9, which can be considered as a very poorly developed prefemur,

and in this case the position of the gonopod muscles is the same in the two genera. The segment (prf) would then be the femur, (fe) the postfemur. For this interpretation I have used another system of lettering bracketed beside the previous notation. The faint line (y) (fig. 9) would not then define a segment seeing that it does not pass right across the gonopod.

In both interpretations of the anterior gonopods of *Burenia attemsii* there is agreement with *B. nasuta* in that the prefemur is a wedge-shaped segment diminishing on its inner side, in contrast to *Rhynchomecogaster.*

The position of *Burenia attemsii* regarding the weak or incomplete formation of boundaries between the telopodite segments is noteworthy, as it shows that too much weight cannot be attributed to the number of gonopod segments alone in regard to genera, and I must draw attention to this fact in connection with unsatisfactory characters of the genera *Rhinotus* and *Siphonotus.*

The physiological significance of the posterior gonopods is as yet unknown, and in this connection I refer to fig. 9 in which the slender terminal segment of the posterior gonopod can be seen hooked into a groove in the terminal segment of the anterior gonopod. What effect is produced by the mechanical coupling of the anterior and posterior gonopods is difficult to say when we know of no analogous occurrences in other Diplopod groups. It reminds me especially of the flagella in *Julidae,* the physiological significance of which I have repeatedly discussed. In my opinion the posterior gonopods are organs of stimulation whose terminal segments, by being inserted in the apical segment of the anterior gonopods, are guided to their correct position for stimulating the female in copulation.

Rhynchomecogaster gracile n. sp.

♂ 16½–19 mm., with 48–56 segments.
♀ 20–21½ mm., with 54–55 segments.

The body appears on the whole to be greyish yellow without noticeable pigmentation.

The narrowly produced fore part of the head gives the appearance of a concavity at the sides. Fore part of the head with 2 rows of bristles on each side below, the outer constituting a laterally projecting fringe of which 3–4 are outstanding in respect of their length and curvature. Forehead with fairly long scattered hairs above; anteriorly on the inner side a long bristle between the ocelli. The

antennae, which are provided with long hairs, are sunk into a circular basal lobe, the distal margin of the fourth segment reaching almost to the apex of the head.

The transversely oval collum (fig. 5) has been already mentioned. Between the antennae 2 + 2 ocelli, the dense pigment round them forming an oblique ellipse on each side.

The coxae of the walking legs, which carry the well-known small coxal sacs, are close to each other, remaining, however, separate in the median line, while between them at their bases is a small sternal horseshoe-shaped lobe, serving as a buffer (fig. 2). Walking legs with long bristles, prefemur and postfemur about as long as wide, femur and tibia on the other hand much longer than wide.

Of the two smooth sternites of each segment the anterior one is rounded behind, the posterior one truncated behind, the postero-lateral angles, however, projecting backwards.

The dense hairs of the tergites have already been mentioned. They are entirely confined to the metatergites, which are twice as long as the prozonites and divided from them by a fine transverse suture. Most of the tergites have five transverse rows of long bristles, and just anterior to their hind margins there are two fine transverse striations. There is a continuation of the transverse suture on the pleurites (fig. 3), the metapleurites being twice as long as the pro-pleurites, bristles being found only on the metapleurites. On their inner inferior margins the pleurites form a blunt angle in the middle, while the anterior margin is not only enlarged, but forms above on the outer side a knob-like projection (fig. 2). The pores of the tergites situated more or less as in *Burenia*.

The anal valves of the telson quite hairless, while the preanal segment (fig. 2) has bristles above as well as at the sides. The anal valves agree with *Burenia* in having their hinder extremities reaching to a little beyond the preanal segment, and the posterior margin of the latter in the middle forms a bluntly rounded projection. In these characters of the telson *Rhynchomecogaster* and *Burenia* differ from *Rhinotus* and *Siphonotus* in which the telson is completely rounded posteriorly and the anal valves end a little in front of the posterior margin of the preanal segment (cp. my paper on Diplopoda in Mjöbergs Australischer Expedition, Arkiv för Zoologie, Stockholm, 1924, Bd. 16, N. 5, Taf. V, Abb. 93 and 100, *Rhinotus mjöbergi* and *Siphonotus latus* Verh.).

The anterior gonopods of *Rhynchomecogaster* have been mentioned above. The following may be added (fig. 6).

The 6 segments described are all clearly separated from one another and the hairs are of considerable length, longer than in *Burenia.* On the outer extremity of the coxa there is a demarcated triangular field; this is either a membrane or the indication of a trochanter. The terminal segment is drawn out into a powerful dagger-like process which has an oblique strip bordering it below at its base and a small notch on its outer side. The posterior gonopods (fig. 7) thus correspond fully with the anterior gonopods in their segmentation. Only on the prefemur are there two fine hairs. The prefemur is not so broad as that of *Burenia*, and the same applies to the two segments proximal to the terminal piece.

Locality.—The numerous specimens before me have the sexes in the proportion of ♂ : ♀ = 1 : 3. Most of the specimens are from Noordhoek, Cape Peninsula, the remainder being from Hermanus, River Zonder End, and Bredasdorp. From these last three localities, I must, however, add, I have seen only females.

Burenia attemsii n. sp.

♂ 11 mm., with 52 segments. ♀ 16 mm., with 53 segments. (The ♂ of *B. nasuta* Att. has 64–88 segments.)

Dorsal surface either a uniform whitish yellow or with 1–2 small transverse greyish-brown stripes on the tergites.

2 + 2 ocelli which lie obliquely close behind each other (according to Attems *nasuta* has only 1 + 1 ocelli, but this is open to doubt as it is easy to overlook the second ocellus on account of the centration of pigment in the ocellar area).

As far as the characters given by Attems go, *nasuta* agrees with *attemsii*, but important differences exist in the anterior and posterior gonopods which have to a certain extent already been discussed. The boundaries of the gonopod segments are sometimes indistinct or incomplete, while in *nasuta* they are well defined. The hairs in *attemsii* are much shorter than in *nasuta*, this being especially noticeable in the terminal segments. The process of the terminal segment in *nasuta* is distinctly stronger, projects far out when seen in profile, and is obliquely truncate at its apex. In *attemsii*, on the other hand, the process of the terminal segment (fig. 8) is not only much shorter, so that seen in profile it hardly projects at all, but it terminates in two small teeth which are opposed to each other, the outer one being provided with a further accessory nodule. The prefemur of the posterior gonopods is provided with a bristle, while in *attemsii*

the posterior gonopods are altogether muticous (fig. 10). The femur of *nasuta* is much wider than long, while in *attemsii* it is a little longer than wide. Attems figured a trochanter between the coxa and prefemur for *nasuta* of which I have seen no sign in *attemsii*.

Locality.—Among several female and immature specimens from Hermanus there was only 1 ♂. Other individuals from River Zonder End and French Hoek.

Attems described his *nasuta* from Knysna, Cape Province.

EXPLANATION OF PLATE XII.

FIG.

1. *Hirudisoma carniolense* Verh. Posterior end of body seen from below. an, anal valves; pr, preanal segment; ul and l, the two preceding segments; m, detractor muscles of the telson.   × 125.

2, 3. *Rhynchomecogaster* n. g. *gracile* n. sp.

2. Posterior end of body seen from below (only the coxae and pre-femora of the last pair of legs drawn in).   × 125.

3. Pleurites of the gonopod segment. v, anterior, h, posterior, u, inferior, o, superior margin; su, suture ; z, knob-like projection.   × 125.

4. *Burenia attemsii* n. sp.   Pleurite of the gonopod segment.   × 125.

5–7. *Rhynchomecogaster gracile* n. sp.

5. Collum seen from above.   × 125.

6. Anterior gonopod seen from in front.   fe, femur.   × 125.

7. Posterior gonopod seen from in front.   × 220.

8–10. *Burenia attemsii* n. sp.

8. Anterior gonopod with its sternite (vv) seen from in front. prf, prefemur; fe, femur; m^1, m^2, muscles.   × 125.

9. Anterior and posterior gonopods seen from behind. The hooked terminal rod of the posterior gonopod is inserted in the terminal joint of the anterior gonopod. co, coxa; vv, anterior, vh posterior sternites.   × 220.

10. Posterior gonopod seen from behind. co, coxa; prf, prefemur; fe, femur; *a, b, c,* the three terminal segments.   × 220.